Contamination Avoidance Detector Test Suite (CADTS)

PM ITTS Industry Conference

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Project Director: Lorraine Castillo

Organization: PM-ITTS PEO STRI

e-mail:lorraine_castillo@peostri.army.mil

Voice (407) 384-5235 Fax (407 384-5248

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Background

- Contamination avoidance refers to the military doctrine of avoiding or minimizing the effects of initial and residual Chemical and Biological (CB) threats.

- The CADTS project is designed to rectify the current broad-based short term deficiencies that exist for testing DoD CB detector systems. Extensive use of COTS and modification of existing hardware will ensure timely deliverable of the improvements to avoid any delays in DT and OT testing of new detector systems.

Background

- Project started in FY 01
- Milestone B approval 19 November 2002
- CTEIP funding $27.7 million
- 10 projects identified
- 5 projects initiated in FY03

Background

Example Current CB Test Deficiencies

- Cannot evaluate active standoff CB detector systems
- Cannot track/quantify/control simulants in a dynamic cloud environment
- Cannot detect agent challenges at very low concentrations
- Cannot adequately correlate static chamber results to operational environments
- Agent/simulant correlation needs improvement
- Need for new systems that produce a realistic threat cloud
- Need to improve response time and overall data collection time

Background

Characteristics of Current CB Testing

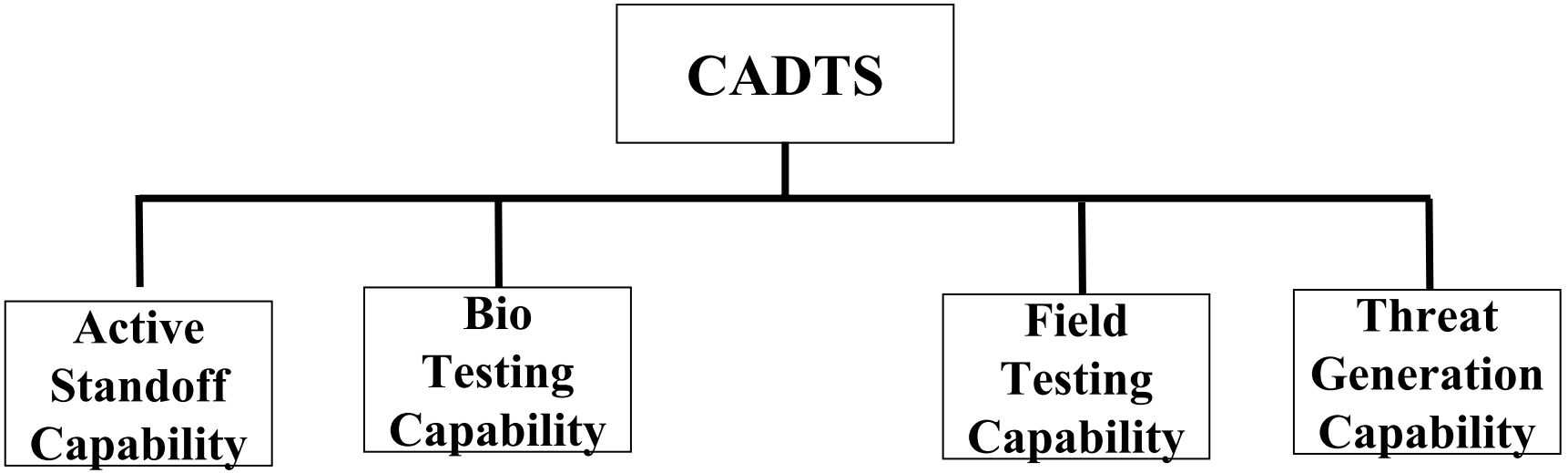
	Chamber	Field Test
Agents	Yes	No
Simulants	Yes	Yes
Good Concentration Control	Yes (Static only)	Measured/Marginal
Reproducible Data	Yes (Static)	No (Dynamic)
Environmental Control	Yes	No
Can Test Interferent Mixtures	Yes	Marginal
Referee System Needed	Yes	Yes
Representative of Battlefield	No	Marginal
Typical Data Channels	400	100
Methodology Development	Yes (up to 1 Year)	Yes (Up to 1 Year)
Typical Set Up Time	2 Weeks	4 Weeks
Time for One Test Series	1 - 5 Days	1-3 Weeks
Cost for One Test Series	$100K and up	$500K and up
Set Up Cost	$300K and up	up $800K and

Background

CADTS Ten Capabilities

- Passive Remote Cloud Tracking and Characterization
- Active Remote LIDAR Including Differential Absorption
- Active Standoff Test Facility
- Joint Ambient Breeze Tunnel
- Near Real Time Polymerase Chain Reaction Biological Referee System
- Biological Agent Inactivation Facility
- Biological Simulant Optimized with Improved Methodology
- Realistic Threat and Operational Test Scenarios
- Dynamic Spectral Projector
- Portable Simulant CB Cloud Generator

Project Organization



* Planned Start Late 4Q FY03

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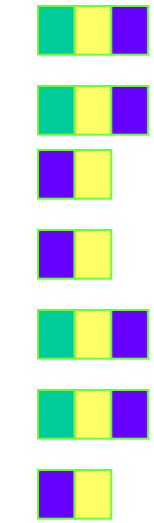
Potential Contracting Opportunities

Team Member	Prime Contractor	Subsystem Expertise
• Nine Projects	• Four Projects	• All Ten Projects

FY03/04 Execution Priority

Project	Award/Start
Joint Ambient Breeze Tunnel	Sept. 03
Dynamic Spectral Projector	Dec. 03
Passive Remote Cloud Tracking	March 04
Biological Simulant Optimization*	March 04
Active Standoff Chamber	April 04
Portable Cloud Generator	April 04
Realistic Threats*	April 04



- Prime to be a government facility

Prime Contractor
Team Member
Subsystem Expertise

1A6/5. Advanced LIDAR Including Differential Absorption

In Progress

Requirement:

This project provides a solution to a critical deficiency at DPG -- the inability to provide cloud tracking data for the DT and OT testing of active standoff detectors. JBSDS and Artemis both employ LIDAR technology. DPG needs to acquire a high resolution LIDAR tracking system. LIDAR is a 35-year old technology and thus the basic theory and hardware are well-characterized. The new system must be in place and operational for PVT/OT testing of JBSDS in FY05.

Elastic Backscatter, differential scattering, and DIAL LIDAR will be used to character aerosols. Doppler LIDAR will provide important wind profile data, while the combination of DIAL, fluorescence, and Raman will enable Chem and Bio threats to be distinguished, and quantified.

1A6/5. Advanced LIDAR Including Differential Absorption

Description/status:

This project develops advanced LIDAR equipment for testing of active standoff, passive standoff, and point detector systems. Deliverables include equipment to measure:1) elastic backscatter; 2) differential scattering; 3) fluorescence effects; 4) wind profile; 5) differential absorption LIDAR; 6) Raman LIDAR.

Software will be written at DPG. A systems engineering approach will allow the concurrent measurement of vapors, aerosols and particulates.
The complete set of platforms will address the testing needs of both Chem and Bio detector systems. Work is underway on the on the fluorescent system (FS) at DPG. The FS will be an add-on to the current differential scattering (DISC) LIDAR that was previously developed at DPG. The DPG DISC LIDAR has been successfully used to help calibrate the modified existing Breeze Tunnel.

6A.5. Active Standoff Chamber

Design In Progress

Requirement:

DPG's current Chem and Bio chambers are not suitable to test active standoff detectors such as JBSDS and Artemis. Due to the short pulse width of the interrogating laser, a chamber length of about 30 m is needed. In addition, the chamber ends must be transparent to light. A semi-clean room staging room is also needed for the set up and maintenance of the optical devices used in active standoff systems.
The entire facility is a key funding requirement, given the relatively complex technologies involved and the test needs of emerging detector systems.

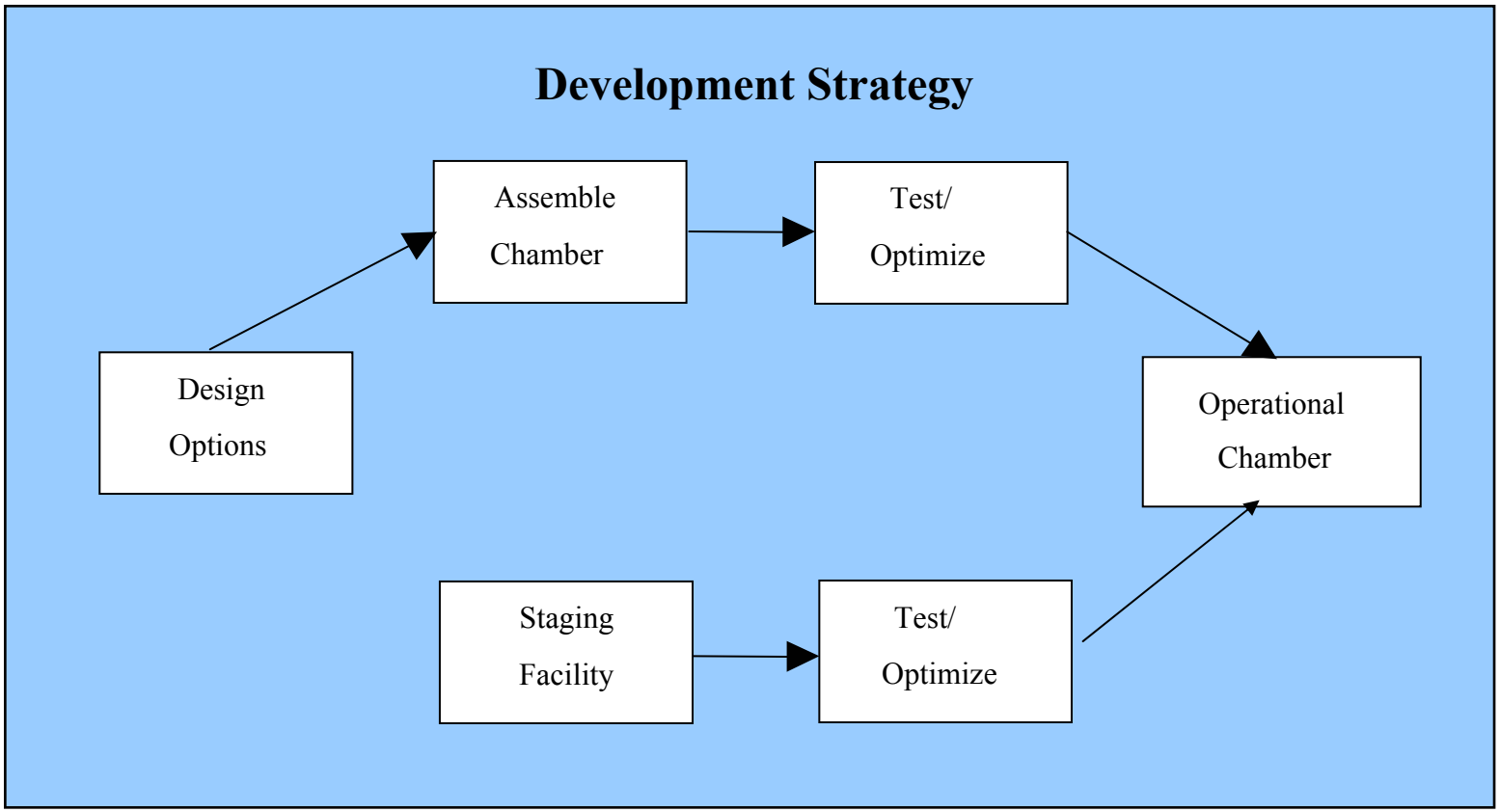
6A.5. Active Standoff Chamber

Description /status:

The chamber will be optically "open" at both ends so that the SUT can view a cloud generated within the chamber from a variety of standoff distances (0.5 - 5 km). Additional needs include a dissemination and monitoring system especially tailored for this application.
An engineering design study for air curtain containment, funded by Artemis, was completed in October 2002.

Battelle has been awarded a contract for engineering design Two key deliverables from this initial effort include 1) demonstration that the containment method meets the leakage rate specified in the SOW, and 2) demonstration that the containment method does not result in a degradation of either the incident laser beam or the scattered light. Upon satisfactory data from the design study, work will commence on chamber assembly and test.

6A.5. Active Standoff Test Chamber



6A2-5. Biological Agent Inactivation Facility

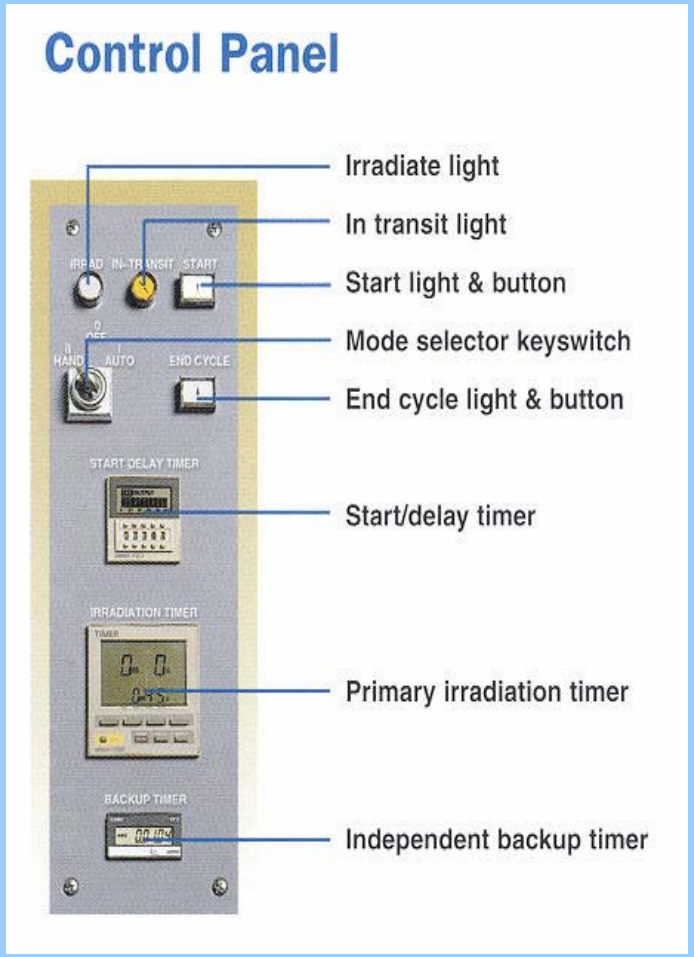
In Progress

Requirement:

In bio detector testing, the use of killed (inactivated) agents is common. DPG prepares and characterizes agents for all other DoD facilities as well as for its internal use. Currently, DPG must ship live agents to USAMRID for inactivation at a cost of $25K per shipment. There is a need to provide an in-house gamma irradiator at DPG.

The methods developed will enable the transition from current biosimulants to “killed” agents. The ability to use an in-house irradiator also enhances the overall quality of the results and reduces risks.

6A2-5. Biological Agent Inactivation Facility



3B1. Near Real Time Polymerase Chain Reaction (PCR) Biological Referee System

Requirement:

In Progress

Currently, DPG uses petri dish microbiology to quantify the bio simulants released in a chamber or field test. This technique, although well-established, requires 18-48-hour process times before any meaningful data can be obtained. The method is the rate limiting step in bio testing and is a major contributor to DPG's backlog in bio testing.

PCR technology affords the opportunity to complete tests in less than two hours, thus speeding up the overall test cycle and reducing costs. Also, more samples can be evaluated for a particular test run, thus improving overall reliability and data quality.

6A2-2. Joint Ambient Breeze Tunnel

NEW

Requirement:

DPG has three major deficiencies for current Breeze Tunnel testing: 1) the current facility can only test bio subsystem components; 2) the existing facility cannot be used for year-round testing; 3) the current facility can only be used for point systems and cannot be used for the evaluation of emerging active standoff detectors.

A larger Breeze Tunnel with different configuration with a design to allow for side "windows" resolves all three of these issues. The new facility will provide DPG with an essential test capability which is required for the JBSDS and Artemis detector programs.

6A2-2. Joint Ambient Breeze Tunnel

Description/status:

A breeze tunnel is a long outdoor structure that serves as an intermediate test platform between a small chamber and a full-up field test. A fan at one end draws in ambient air. Simulants are released at the air intake end of the tunnel and travel towards the fan end.
This project develops a tunnel with the following projected characteristics: length 225 feet; cross sectional diameter 40 feet; weather-protecting enclosure; variable air velocity from 0-5 mph; HEPA filtration system; standoff configuration design for perpendicular and through viewing of cloud movement; detector system outside the tunnel at a distance up to several km; ability to present dynamic challenges.

A draft SOW has been released and white papers have been reviewed. The results of tests on the JBSDS-modified existing Breeze Tunnel and analysis of the white papers will determine the scope of this project.

Prototype Breeze Tunnel at DPG

6A2-2. Joint Ambient Breeze Tunnel

Key Technical Issues

- Design and assembly
- Evaluation of standoff LIDAR systems
- Optimization for dynamic cloud testing
- Dissemination of wide range of materials
- Referee instrumentation
- Data collection and analysis

2C3. Dynamic Spectral Projector (DSP)

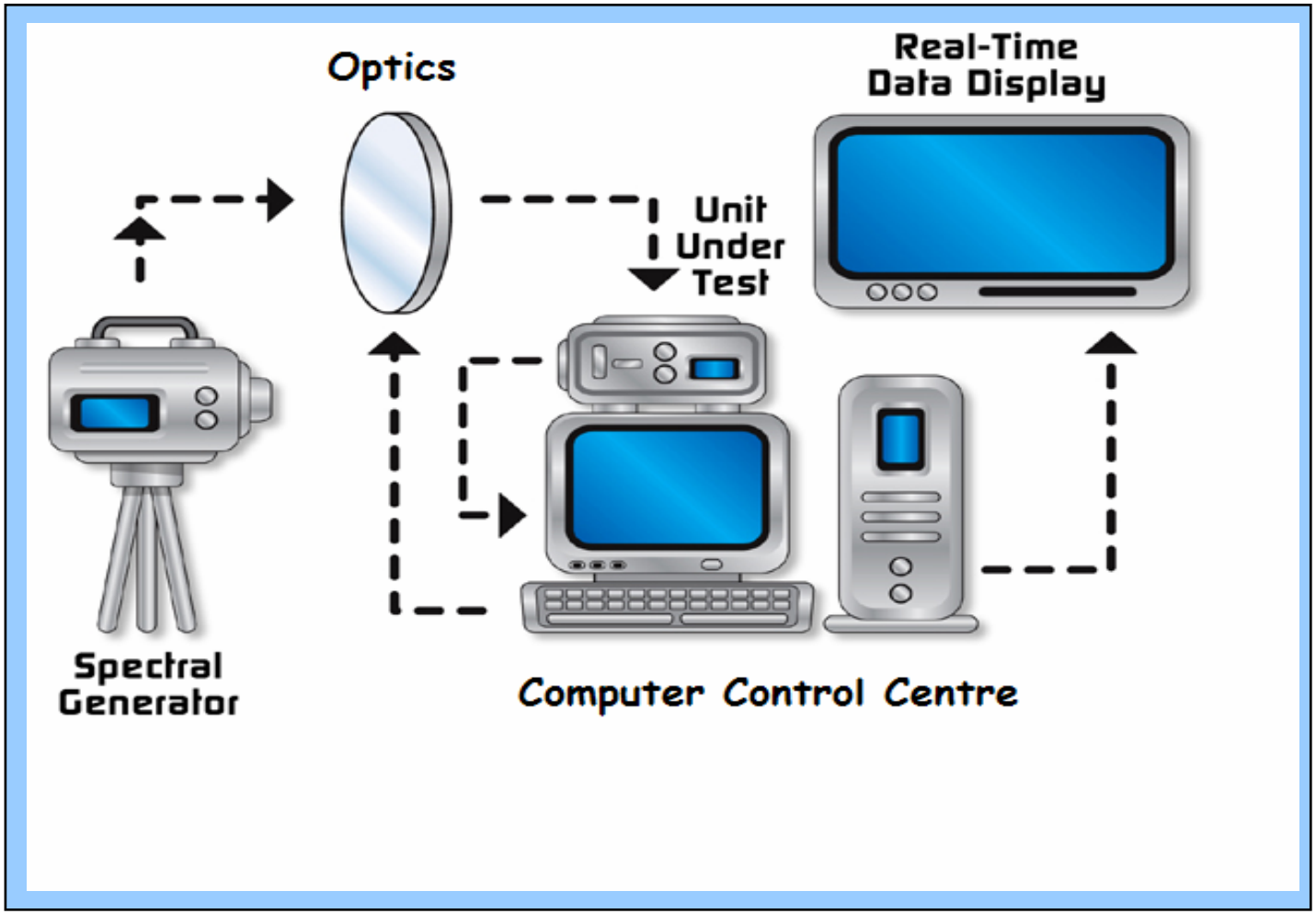
Requirement:

NEW

Emerging DoD detectors require validation over a wide range of operating conditions that make it both impractical and cost prohibitive to use only conventional chamber and field tests. There is a critical need for a device that can synthetically simulate the spectral signature of an agent then dynamically stimulate the detector under test. The dynamic DSP will fulfill this critical need.

A static version is under development at DPG, but a dynamic device is essential for testing active standoff detectors such as Artemis. The overall test time for any detector will be substantially reduced using the DSP.

2C3. Dynamic Spectral Projector (DSP)



2C3. Dynamic Spectral Projector (DSP)

Key Technical Issues

- Design and assembly
- Simulator for active standoff systems
- Optimization for dynamic simulation
- Modeling correlations
- Requirement for multi-component challenges
- Background simulation
- Turnkey operation by technician level

6A.5. Active Standoff Chamber

Description /status:

NEW

The chamber will be optically "open" at both ends so that the SUT can view a cloud generated within the chamber from a variety of standoff distances (0.5 - 5 km). Additional needs include a dissemination and monitoring system especially tailored for this application.
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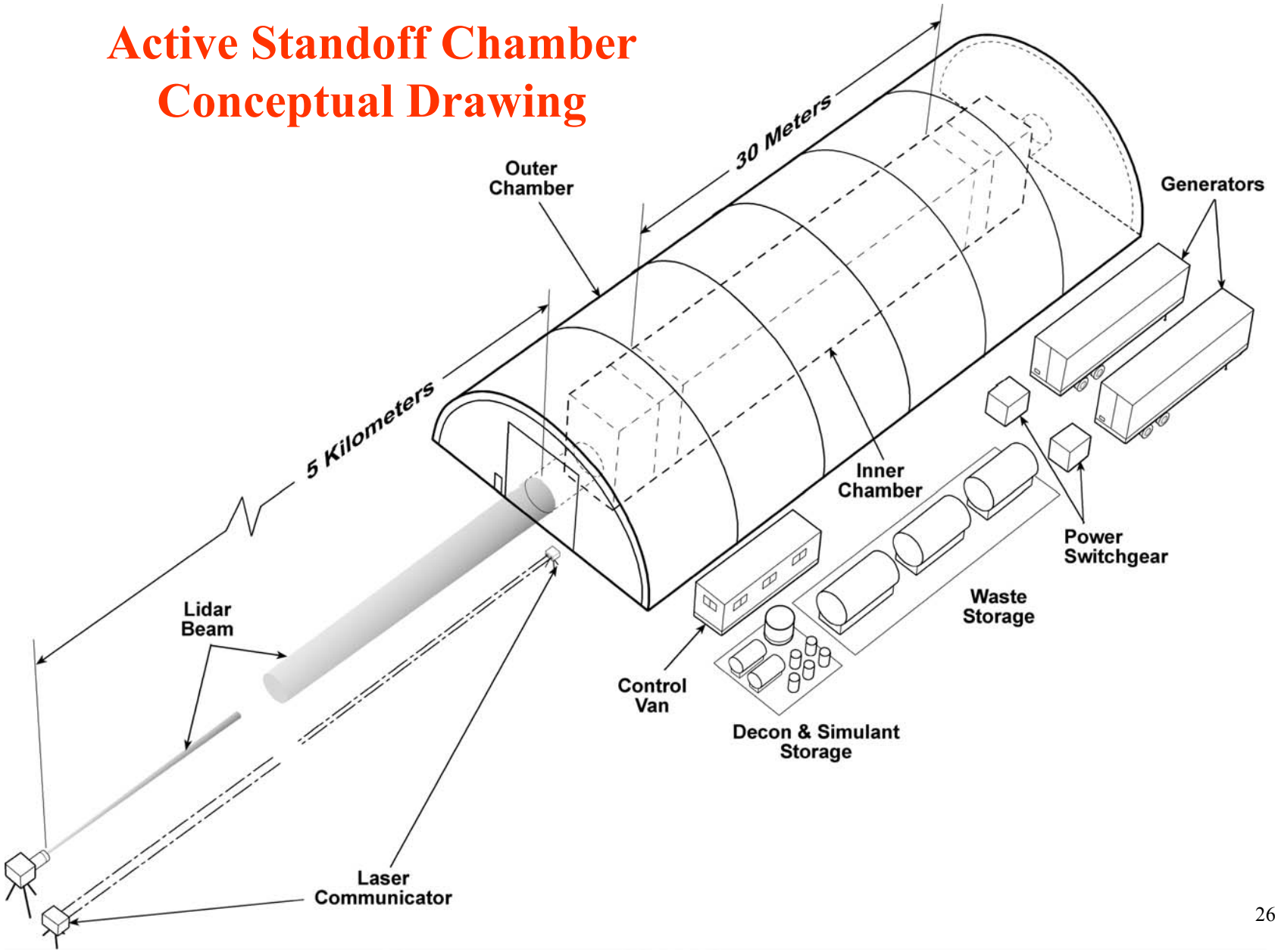
Active Standoff Chamber Conceptual Drawing



6A.5. Active Standoff Test Facility

Key Technical Issues

- Assembly at DPG and validation
- Evaluation of standoff LIDAR systems
- Optimization for static cloud testing
- Dissemination of wide range of materials
- Concentration stability in the cloud
- Referee instrumentation
- Data collection and analysis
- Efficient decontamination

1A2. Passive Remote Cloud Tracking

Description/status:

NEW

This project is part of an effort to develop a new/enhanced cloud tracking system. Complementary technologies will be developed to track vapors : 1) Chemical Cloud Tracking System (CCTS) using open path Fourier transform spectrometry (FTIR) and 2) Dual-Radiometer Data Acquisition (DRDA) using thermal imaging IR radiometry with narrow band filters. The limitations of each device are compensated by an advantage of the other. In this way, the entire needs of emerging detector systems can be met.

A systems engineering approach will integrate these two technologies to enable vapors, aerosols and particulates to be tracked in real time.

4C1. Biological Simulant Optimized with Improved Methodology

NEW

Description/status:

This project optimizes and expands the current DPG inventory of Bio simulants. A literature search will identify a broad range of candidates. These will be screened for activity and physicochemical properties. The best of this group will be evaluated in detail. Characterization tests include: particle size, aerosol stability, surface charge, powder flow and the ability to be encapsulated.

Assay procedures will need to be developed. Environmental documentation will be conducted, as necessary. The final step will be an evaluation of the materials in field tests using standard dissemination equipment.

1A8. Portable Simulant CB Cloud Generator

NEW

Requirement

DPG has built and tested a prototype portable field test cloud disseminator for use with chemical simulants. In basic form, the device consists of a 40-foot long stack that can be divided into two halves suitable for transport on a flat bed truck. The system contains all instrumentation and dissemination pump hardware.

The concept has proven to have good utility but enhancements are desirable for extended use: 1) operation by one person;
2) Ability to disseminate both chemical and biological simulants;
3) Improved system for conjoining the stack components and
4) improved ruggedness.

2B4. Realistic Threats

NEW

Description/status:

This project evaluates, develops and validates improvements in threat generation know-how, including characterization methods, dissemination hardware and dissemination methodologies.
The key deliverables are the ability to generate realistic threat clouds and operational test scenarios that will satisfy the ORDs of emerging detector systems.

The project must start with a comprehensive evaluation of all the basic factors that impact threat generation. Existing dissemination methods will be evaluated for improvement potential. Novel disseminators, such as ultrasonics and other shock wave devices, will be compared for technical prowess. The evaluation of interactions of materials with the forces and temperatures involved in the dissemination process is a crucial aspect. Chamber and field test scenarios will be tested. Extensive coordination will be required with SBCCOM, DTRA and other agencies involved in CB threats.

CADTS Technical Team

Lorraine Castillo	PD	PEO STRI
Eddie Meadows	Deputy PD	AEgis Tech
Dr. Art Maret	Chief Scientist	AST, Inc
CT Nguyen	System Engineer	PEO STRI
Glenn Daens	Logistician	PEO STRI
Antonio Diaz	Engineer	AST, Inc
Robert Guadalupe	Engineer	AST, Inc
Dr. Lyman Condie	Coordinator	DPG

e-mail: PD - lorraine_castillo@peostri.army.mil

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CADTS Contracts Team

Shirley L. Eaton	**PCO**	**PEO STRI**
Sherry Alexander	**Contract Specialist**	**PEO STRI**
Louise Williams	**Contract Specialist**	**PEO STRI**

e-mail: PCO - shirley_eaton@peostri.army.mil
sherry_alexander@peostri.army.mil
louise_williams@peostri.army.mil

IMO

Acquisition/Contracting

Strategy

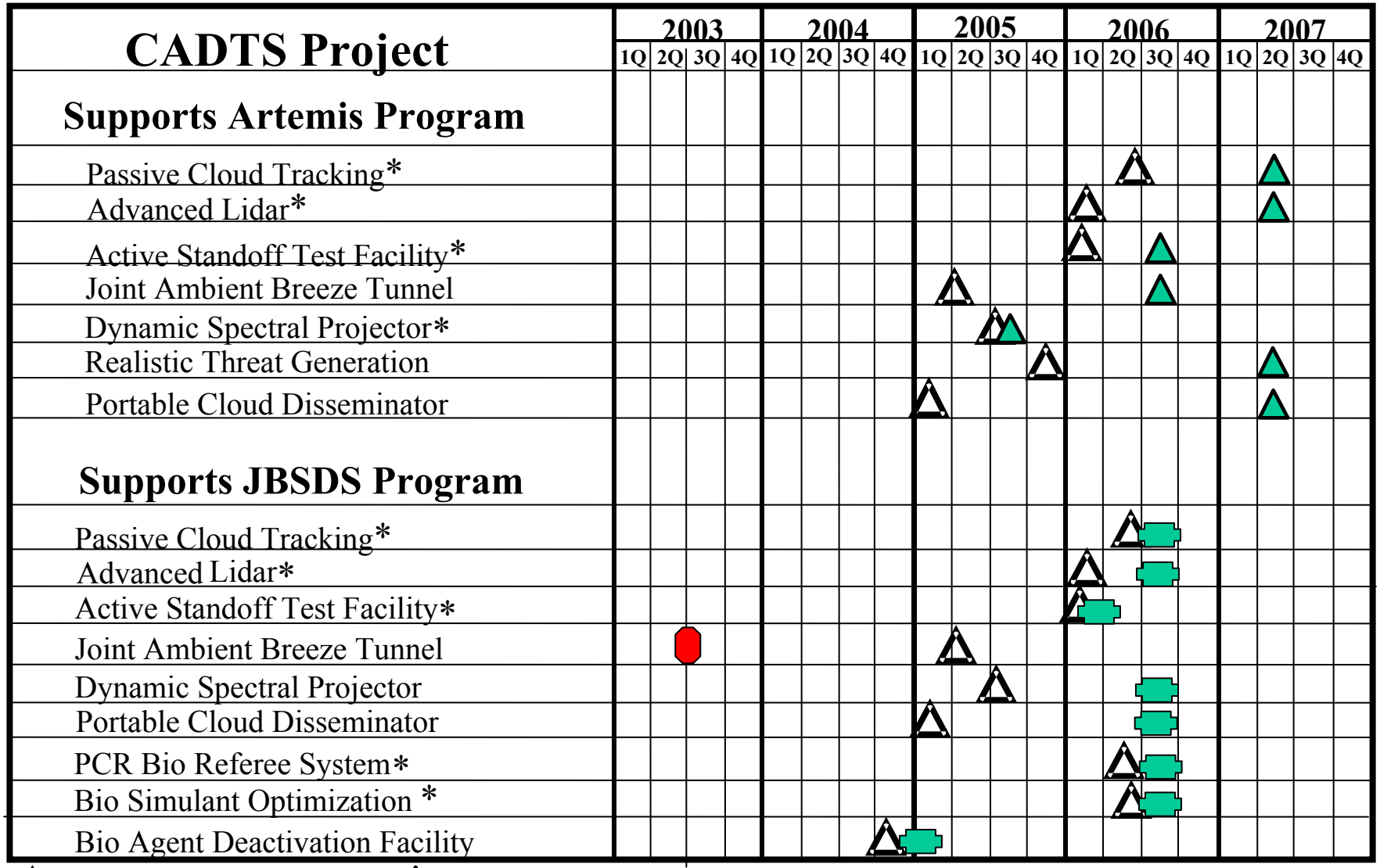
- 04 CTEIP funding $13 million
- 10 Capabilities currently planned for development
- Hardware and technology development scheduled for 4 years
- Competition will be full & open
  - some small business set aside and academia involvement
  - government agencies

Overall Issues

- Need to meet test schedules of JBSDS and Artemis detector programs
- Multidisciplinary technical issues

IMO

CADTS IOCs vs. Artemis/JBSDS Test Schedules



Planned CADTS IOC **Project Meets Artemis Block I Schedule**

Project Meets JBSDS Block II Schedule **Project Does Not Meet JBSDS Block I PQT**

*Some capability will be available before the IOC date

Updated: 05/30/03

Key Evaluation Criteria

(Basis for Award)

The evaluation factors and significant sub-factors that establish the requirements of acceptability shall be set forth in the solicitation.

- **Criteria(s) may include but are not limited to:**
  - **Technical approach**
  - **Program management approach**
  - **Past performance**
  - **Price/cost**
- **Criteria tailored to individual acquisitions**
- **Will be stated in RFP**

SUMMARY

- **CADTS is in the acquisition phase!**

- **4 projects in progress**
- **Breeze Tunnel planned for initiation late 4Q FY03**
- **Five projects to be initiated in FY04**
- **Several contracts to be awarded**
- **Many opportunities for technology input and COTS equipment**

- **For information:**
  - **FedBizOpps**
  - **STRIBOM**
  - **CADTS Newsletter**
  - **Encourage recommendations/ suggestions on any aspect – contract strategy, technology, etc.**